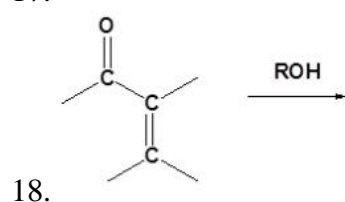
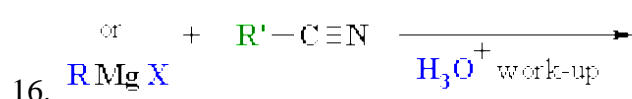
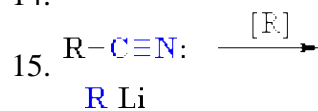
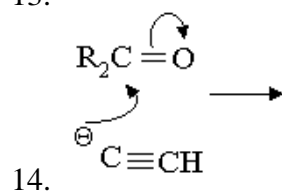
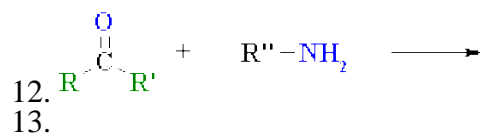
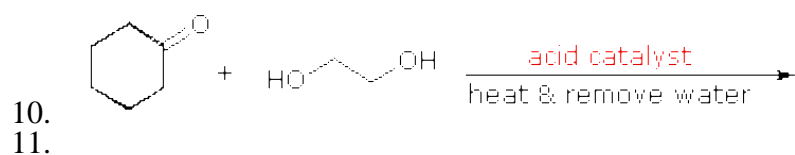


Complete the following reaction:

1. 1-phenylethyl chloride with sodium methoxide
2. Bromoethane + OH^-
3. S-3-chloro-3-methylhexane + iodide ion
4. 2-bromo-2-methylpropane + H_2O
5. α -phenyl ethanol + thionyl chloride
6. 2- Bromo propanoate anion + OH^- (low con.)
7. Pyridine + NH_2^-
8. Chlorobenzene + NH_3
9. Benzyne + THF



Write the mechanism of the following:

1. **Hydrolysis of tert-butyl bromide**
2. **$\text{S}_{\text{N}}1'$ reaction**
3. $\text{S}_{\text{N}}2'$ reaction
4. $\text{S}_{\text{N}}\text{i}$ reaction
5. $\text{S}_{\text{N}}\text{i}'$ reaction

6. Base hydrolysis of 1,2-chlorohydrin
7. **Hydrolysis** of acid chloride
8. **Acid-catalyzed ester hydrolysis**
9. Nitrobenzene + OH⁻
10. p-Chloro nitrobenzene + OCH₃⁻
11. o-Chloro toluene + NH₂⁻/ NH₃
12. Acetone + 1mol ethanol
13. Butanone + HCN
14. Propanone + AlH₄
15. 2-pentanone + CH₃CH₂MgCl
16. Acetone + ethylamine
17.
$$\begin{array}{c} \text{O} \\ \parallel \\ \text{R}-\text{C}-\text{CH}_2\text{R}' \end{array} + \text{R}_2\text{NH} \longrightarrow$$
18. base-catalyzed addition of aliphatic nitro compound to carbonyl groups
19. **Hydrolysis of Nitriles**
20. $\text{RMgX} + \text{R}'-\text{C}\equiv\text{N}$
21. Propene + Br₂ + peroxide
22. Propene + HBr
23. **Acid catalyst** nucleophilic conjugate **addition of alcohols.**
24. base **catalyst** nucleophilic conjugate **addition of alcohols.**

answer the following:

1. The S_N2 reaction known as backside attack reaction, why?
2. The rate of hydrolysis of methyl bromide that acquires S_N2 mechanism is greater when (RO⁻) is used as nucleophile than ROH, why?
3. Along a period, nucleophilic strength decreases gradually as the electronegativity of atoms increases. For examples, C, N, O, F, why?
4. Bromide ion (Br⁻) is a better nucleophile as compared to chloride ion (Cl⁻), why?
5. Methoxide ion is more reactive than carboxylate ion as nucleophile, why?
6. Protic polar solvents will reduce the reactivity of this nucleophile in S_N2 reactions, why?
7. Iodide (I⁻) is a good leaving group as compared to chloride (Cl⁻), why?
8. The rates of S_N1 reactions are generally increased by the use of a highly polar solvent, why?
9. It was found that the product of S_Ni mechanism is formed with complete retention of configuration, why?
10. NGP is example of retention configuration in nucleophilic substitution reaction, why?
11. EtSCH₂CH₂Cl is found undergo hydrolysis 10⁴ times faster than EtOCH₂CH₂Cl under same condition, why?
12. The more electronegative group is the greater ability to attract electrons which increases the rate of formation of the cyclohexadienyl anion, why?

13. Attack by nucleophilic on an unsubstituted benzene nucleus will be much more difficult than attack by electrophiles, why and how overcome this problem?
14. Under normal conditions, nucleophilic substitution at vinylic carbon is extremely slow compared to substitution at saturated carbon, why?
15. What is the super leaving group and when it is commonly used?
16. What is the difference between the reaction of carboxylic derivatives and those of simple carbonyl compounds (aldehydes and ketone).
17. Under strongly basic conditions, nucleophilic substitution can occur without the action of resonance or withdrawing groups on the ring, how?
18. Compare between the following reaction, then give the reason.

$$\text{I}^- + \text{ROH} \rightarrow (\text{NO REACTION})$$

$$\text{I}^- + \text{R-O}^+\text{H}_2 \rightarrow \text{RI} + \text{H}_2\text{O}$$
19. order the following alkyl halides according to the reactivity of towered $\text{S}_{\text{N}}2$ reaction: Pri. alkyl halide, Sec. alkyl halide, Ter. alkyl halide, Methyl halide, then give the reason.
20. The rate of nucleophilic addition be reduced by **electron donating R** groups and **enhanced by electron withdrawing** ones in aldehydes reactions, why?
21. The rate of nucleophilic addition be reduced when the $\text{C}=\text{O}$ group is conjugated with $\text{C}=\text{C}$ in ketones reaction, why?
22. How Carbonyl compounds be protected by conversion to acetal in base-catalysed reaction
23. Why amine can't be used as nucleophiles in strongly acidic media?
24. Secondary amines react with aldehydes to give **carbinolamines** which then dehydrate to give **enamines not imines**
25. In nucleophilic addition **weaker nucleophiles** (neutral) require that the $\text{C}\equiv\text{N}$ be activated prior to attack of the **Nu**, why
26. Nitriles react with Grignard reagents to give ketones. On other hand ketones are more reactive to adding it to Grignard reagent and produce alcohols, how the final product of reaction is only ketone